

KNOWLEDGE INSTITUTE OF TECHNOLOGY
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Beyond Knowledge

Question Bank

AUTOMOBILE ENGINEERING

Department of Mechanical Engineering

UNIT-I

PART A (2 MARKS)

1. Define an Automobile.

An Automobile is a self-propelled vehicle, driven by an internal combustion engine which is used for the transportation of goods & passengers on road.

2. How automobiles are classified into different types?

- Based on Make & Model
- Based on Fuel
- Based on Body Style
- Based on number of Wheels
- Based on Drive
- Based on Transmission

3. What is meant by self-propelled vehicle?

A self-propelled vehicle is known as an “Automobile”

4. List the various manufacturers of automobile products in India.

- Maruti, Hyundai, Nissan, Ford – Passenger Vehicles
- Tata, Ashok Leyland – Heavy Commercial Vehicles
- Bajaj, Hero Honda, TVS Suzuki – Two Wheelers
- Bajaj, Mahindra – Three Wheelers

5. State the major types of automobiles according to the fuel used.

- Petrol Engines (SI engines)
- Diesel Engines (CI engines)
- Gas Engines (either SI or CI mode)

6. Classify automobiles with respect to the drive of the vehicle.

- Front wheel drive
- Rear wheel drive
- All four wheel drive
- Left hand drive
- Right hand drive

7. What is meant by the term Chassis?

A complete vehicle without a body structure is known as Chassis. It comprises of basic structure, power unit, transmission system, controls and auxiliaries.

8. What are the functions of a frame?

- To support the chassis components and the body.
- To withstand static and dynamic loads without undue deflection or distortion.
- To carry the load of the passengers or goods carried in the body.

9. List out the various materials used in the construction of chassis frames.

- Low Carbon Steel - 0.18 or 0.20 % carbon content
- High Carbon Steel - 0.25 % carbon content
- Alloy Steel – With alloying elements like Ni & Cr

10. What are the types of frames?

- Ladder type frame
- X type frame
- Backbone type frame

11. Name the different kind of resistances to vehicle motion.

- Air resistance
- Rolling resistance
- Gradient resistance

12. Why is the frame narrow at front?

The frame is narrowed at the front to provide a better steering lock. This also permits smaller turning circle radius

13. List out the various materials used in the construction of vehicle body

- Wood
- Metals
- Plastics
- Mixed construction of all these materials

14. Why are the side members of the frame upswept at two places?

The frame is upswept at the rear and front to accommodate the movement of the axles due to springing. It also keeps the chassis height low.

15. What is the function of a bumper?

A bumper is the front- most or rear-most part, which is designed to allow the vehicle to sustain an impact without damage to the vehicle's safety systems

16. What are the stresses to which the frame members are subjected to?

- Frame longitudinal members – bending stress
- Frame side members – twisting stress

17. Name few components of engine.

- Cylinder block
- Cylinder head
- Crankcase
- Cylinder
- Piston
- Connecting rod
- Crankshaft
- Camshaft
- Valves
- Spark plug (in the case of petrol engine)
- Fuel injector (in the case of diesel engine)

18. What are the two types of cylinder liners?

- Dry liners
- Wet liners

19. What are the functions of piston rings?

To provide a gas tight seal between the piston and cylinder liner to prevent the escape of gases from top side of the piston to the underside.

20. What are the two types of piston rings?

- Compression rings
- Oil rings

21. State the differences.

Parameter	SI Engine	CI Engine
Type of fuel	Petrol	Diesel
Compression Ratio	Low (6 to 10)	High (12 to 24)
Operating cycle	Otto cycle	Diesel or Dual cycle
Thermal efficiency	Low	High

22. What is clearance volume? And what are its effects?

- The volume above the piston, when it reaches TDC is known as clearance volume.
- The clearance volume is inversely proportional to the compression ratio.

23. What is the function of piston, connecting rod, crank shaft and cylinder head?

- Piston – The piston assembly transfers the force from the power stroke to the crankshaft
- Connecting rod – converts reciprocating motion of piston into rotary motion of crankshaft
- Cylinder head – it acts as a top cover to the cylinder block. The valves are placed in the cylinder head in an overhead valve engine.

24. What is meant by P.C.V? And what are its effects?

PCV – Positive Crankcase Ventilation

It is used to reduce the blow-by and thereby unburned hydrocarbon emissions

25. Write down the firing order a 4 cylinder and 6 cylinder engine

4 cylinder engine firing order: 1-4-3-2

6 cylinder engine firing order: 1-5-3-6-2-4

26. Mention about the types of VVT.

- Cam changing VVT
- Cam phasing VVT.
- Combined cam changing & cam phasing VVT

27. Mention the vehicles using VVT.

- BMW (Type of valve: Valvetronic)
- Honda (Type of valve: VTEC)

PART B (13 MARKS)

01. Explain the construction of various frames used in automobiles with neat sketch. (AUC Dec'9, May'7)

02. Explain the following terms:

- i) Load distribution in frames
- ii) Frame types with neat sketch
- iii) Frame materials
- iv) Frame testing.

03. What are the aspects considered in the design and construction of a body? (AUC Dec'14)

04. Explain the various components of an engine with neat sketch. (AUC Dec'8, 14, May'6)

05. What are the types of valve used to control air fuel mixture in the engine cylinder to force the exhaust gaseous out at correct time?

06. Explain engine classification based on valve arrangement with a neat diagram. (AUC May'11)

07. Draw the layout of an automobile and indicate the various components. (AUC Dec'5, May'10, Dec'12)

PART C (15 MARKS)

01. Discuss about i) Aerodynamic drag ii) Rolling resistance & iii) Gradient resistance. (AUC Dec'13, May'11)

02. Explain briefly semi-integral & integral type vehicle body construction. (AUC Dec'14)

UNIT-II
PART A (2 MARKS)

1. Mention the function of carburetor?

The function of a carburetor is to atomize and vaporize the fuel, mixing it with air in varying proportions to suit the engine operating conditions of vehicles.

2. Define the terms Vaporization & Atomization.

- Vaporization is a change of state of the fuel from a liquid to a vapor
- Atomization is a mechanical breaking-up of the liquid into small particles so that every minute particle of fuel is surrounded by the air.

3. What are the merits and demerits of mono point and multi point fuel injection system?

Sl.No	Mono Point Injection	Multi Point Injection
1	Single injector is sufficient	Separate fuel injector for individual cylinders
2	Low cost	High cost
3	Low injection pressure	Comparatively higher injection pressure
4	Slightly higher SFC and emissions than MPFI	Low SFC and engine emissions

4. What is Gasoline Direct Injection?

The gasoline (petrol) is directly into the cylinder at the end of compression stroke as such in diesel engines. This is called Gasoline Direct Injection (GDI)

5. What is conventional Ignition system?

The conventional ignition system gets its electrical voltage either from battery or dynamo, which will be boosted to a very high voltage due to which spark is produced in the cylinder to combust the mixture.

6. What are the classifications of an ignition system?

- Coil ignition system or battery ignition system.
- Magneto ignition system
- Electronic ignition system and
- Transistorized ignition system

7. Name the component of Battery coil ignition system used in vehicles

- Distributor
- Contact breaker
- Primary winding
- Secondary winding

8. Define common rail injection system.

A common rail which is maintaining high fuel pressure is connected to individual fuel injectors of a multi cylinder engine

9. What is unit injection system?

It is an integrated direct fuel injection system for diesel engines, combining the injector nozzle and the injection pump in a single component.

10. What is a rotary distributor?

The rotary distributor has a rotating element, which releases a high intensity spark to the individual spark plugs according to the engine firing order.

11. What is the function of a spark plug?

The spark plug is a device to produce electric spark to ignite the compressed air-fuel mixture inside the cylinder.

12. What is an Electronic ignition system?

The ignition system, in which the mechanical contact points are replaced by electronic triggering and switching devices, is known as electronic ignition system

13. What are the functions of Turbo chargers?

- To produce more power from the same size engine
- To provide the altitude compensation
- To improve more complete combustion & hence less emissions

14. Why the engine emissions to be controlled?

Some of the engine emissions are carcinogenic. Moreover, the engine emissions led to greenhouse effect. For these reasons, the engine emissions need to be controlled.

15. What are the advantages of petrol injection?

- High power can be developed
- It has quick starting characteristics
- It has lowest specific fuel consumption
- Less engine emissions than carbureted engines

16. What is super charging?

The process of increasing the density of inducted charge/ air is known as supercharging. It is performed for the following reasons.

- To produce more power from the same size engine
- To provide the altitude compensation
- To improve more complete combustion & hence less emissions

17. What are the advantages of electronic fuel injection system over conventional injection?

- Cold starting is easier
- High fuel economy
- Less engine emissions
- Quick response to varying engine operating conditions

18. What is the function of an ignition system in I.C engine?

The function of an ignition system is to ignite the air-fuel mixture at the end of the compression stroke.

19. What is meant by turbo charging?

Increasing the density of inducted charge/air by using a compressor which gets its power from exhaust driven turbine is known as Turbo charging.

20. What are the factors that fuel vaporization?

- Concentration of the substance evaporating in the air
- Concentration of other substances in the air
- Flow rate of air
- Inter-molecular force
- Surface area
- Pressure and temperature of the substance

21. What is meant by compensation?

The process of providing additional air or fuel when it requires to maintain the correct air fuel mixture is called compensation in carburetor.

22. State the purpose of turbocharger.

- To reduce the weight per horse power of the engine as required in aero engines.
- To reduce the space occupied by the engine as required in marine engine.

23. Enlist the limitation of turbocharging.

- Special exhaust manifold are required for the turbo charging system.
- In order to inject more fuel per unit time, the fuel injection needs modification.

- It is difficult to obtain good efficiency over a wide range of operations since the efficiency of the turbine blades is very sensitive to gas velocity.

24. What is gasoline injection system?

If the fuel is injected directly into the combustion chamber instead of the intake port, the injection system is said to be gasoline injection system.

25. What are the various methods used for the measurements of emission parameters?

- Promulgated in the federal register
- Source category approval alternative methods.
- Historical conditional method
- Draft method of direct measurement of gas velocity and volumetric flow rate.
- Particulate screening method.

PART B (13 MARKS)

1. What is unit injector system? Explain its types with suitable diagram. *(AUC May'12)*
2. Describe the construction and working principles of Battery-Coil ignition system.
3. Explain a turbocharger with neat sketch. *(AUC May'8, Dec'13)*
4. Explain CDI ignition system with a suitable diagram. *(AUC May'8)*
5. Brief the modifications to be done in an engine to make it suitable for supercharging. *(AUC May'14)*
6. With the help of neat sketches explain in detail about Electronic Ignition Systems.
7. What do you know about emission norms? Discuss. *(AUC May'9)*
8. Discuss the construction and working principle of 3-way catalytic controller.
(AUC May'7, 8, Dec'8, May'9, 10, 11, Dec, 11, May'13, Dec')

PART C (15 MARKS)

1. Explain the working principles of electronic fuel injection system. *(AUC Apr'5, Nov'7, Dec'8, 12, May'14)*
2. Explain the operation of a MPFI system and compare it with TBI system.
(AUC Nov'7, Dec'8, 9, Apr'10, May'11)
3. Explain the following with suitable sketches
 - i) Rotary Distributor type injection system.
(AUC Dec'14, May'15)
 - ii) Common Rail Direct Injection System (CRDI)
(AUC Dec'14, 15, May'14)

UNIT-III

PART A (2 MARKS)

1. What is the function of clutch?

The function of the clutch is to connect and disconnect the engine with road wheels. The clutch has to be disengaged during gear shifting, idling etc.

2. What are the types of clutch?

❖ Friction clutches

- Single plate clutch
- Multi plate clutch
- Cone clutch
- Semi centrifugal clutch
- Centrifugal clutch

❖ Fluid Clutches

- Fluid Fly wheel/Fluid Coupling

3. State the requirements of an automotive clutch

- Torque transmission should be maximum
- Gradual engagement of clutch plates
- Heat dissipation should be more
- Dynamic balancing of clutch components
- Vibration damping
- Size should be small
- Inertia should be low
- Clutch free pedal play should be sufficient
- Ease of operation

4. Why you need a gear box?

When a vehicle is moving on a road, it has to encounter different resistances depending upon the road surface, vehicle speed and road gradient. Hence, wheel torque required at road wheels is different for different operating conditions. To satisfy this requirement, a gearbox is necessary in a vehicle.

5. What is the function of gear box? State its types.

❖ The functions of the gearbox are

- To provide the leverage ratio
- To provide the neutral position
- To provide a means to reverse the vehicle

❖ Types of gear boxes are

- Sliding mesh gearbox
- Constant mesh gearbox
- Synchromesh gearbox
- Automatic gearbox – Torque converter

6. Why is gear box necessary in automobile?

- The variation of resistance to vehicle motion at different speeds
- The variation of tractive effort of the vehicle required at various speeds for above said reasons, a gearbox is necessary in an automobile

7. What is tractive effort?

The torque available on the wheel produces a driving force which is parallel to the road known as tractive effort.

8. Why is sliding mesh gear box not preferred?

- More noise
- More wear and tear on the gears
- For smooth, quiet and quick change of gears, the driver requires great skill For the above-said drawbacks, the sliding mesh gearbox is generally not preferred.

9. What is an over drive?

When the speed of the output shaft is greater than the speed of the input shaft, then the drive is known as overdrive.

Example: 0.8:1 or 0.9: 1

10. What is a universal joint? What are its types?

Universal joint is a type of flexible joint between two shafts who axes intersect and may assume different inclinations at different times. It is used to transmit power even at inclined angles of the shaft.

Types

- Yoke joint
- Single cardan joint
- Double cardan joint
- Rag joint
- Canfield joint

11. What is a fluid coupling?

Fluid coupling is device which transmits torque due to the kinetic energy of the moving fluid. In a fluid coupling, two members namely impeller and turbine are present.

12. What is the use of torque convertor?

The torque converter is device which provides a varying torque ratio using fluid energy. In a torque converter, three members namely impeller, turbine and stator are present.

13. State the forces act on the rear axle

- Shear force due to vehicle weight
- Bending moment due to vehicle weight
- Driving torque
- Shear force due to side thrust
- Bending moment due to side thrust

14. What are the different types of rear axles?

- Semi floating rear axle
- Full floating rear axle
- Three quarter floating rear axle

15. What is the purpose of Stator in the Torque Converter?

The stator changes fluid flow between the turbine and pump and thus permits the torque multiplication. Without a stator, a torque converter will simply act as a fluid coupling.

16. Why Synchronizer is required in the automotive transmission system?

Synchronizer is used to equalize the speed of two mating surfaces, before the contact is established. By doing so, wear & tear and noise can be avoided.

17. What is transfer box? Where it is used?

The transfer box is used to convert 2 wheel drive into 4 wheel drive. This is mainly used in hill regions.

18. What are two types of vehicle suspensions?

- Rigid axle suspension
- Independent suspension

19. What is the purpose of Stator in the Torque Converter?

The stator resides in the center of the torque converter. Its job is to redirect the fluid returning from the turbine before it hits the pump again. This dramatically increases the efficiency of the torque converter.

20. What is known as one way clutch?

The one way clutch or unidirectional clutch will transmit a drive when rotated in one direction and will „freewheel“ when turned in the opposite direction.

21. What is known as selective transmission?

Selective transmission is a transmission in which the available forward and reverse gears may be engaged in any order without passing progressively through the different changes of gear.

22. What are the advantages of overdrives?

- (i) It allows a lower engine speed to maintain the car at highway speed
- (ii) It does not require as much power to keep it moving. Therefore, the engine can turn more slowly, produce less power and still maintain car speed.
- (iii) This system saves fuel
- (iv) Wear on the engine and accessories are reduced.

23. What is the use of slip joint in transmission system?

A slip joint is used between a propeller shaft and universal joint connecting the propeller shaft o compensates the changes in length and it helps tp transmit power from the engine to the rear axle at the same time.

PART B (13 MARKS)

1. Explain the types of gear boxes in detail with neat sketch. (AUC May'14)

2. Discuss the working principles of

(i) Torque tube drive. (AUC May'9, Dec'14)

(ii) Hotchkiss drive. (AUC Dec'7, 9)

3. Discuss about the working principle of single plate clutch. (AUC Apr'5, 6, May'15)

4. Explain different type of rear axles with neat sketch.

5. With neat sketch, explain the working principle of Synchromesh Gear Box. (AUC May'11, Nov'5)

6. Discuss the construction and operation of constant mesh gear box. (AUC Dec'9, May'10, 12)

7. What are the features of a good quality clutch? Explain the working of multi plate clutch with a neat sketch.

8. What is meant by clutch? List out the requirements of a clutch. (AUC Nov'5, Nov'7)

PART C (15 MARKS)

1. Discuss the fully floating axle and three-quarter floating axle with neat sketches.

2. Explain the principle and working of a differential with a neat sketch.

(AUC Nov'5, Apr'6, Dec'7, May'9, May'11, May'14, Nov'14, , May'15)

3. Explain with suitable sketches, the operational features of sliding mesh gearbox.

UNIT-IV

PART A (2 MARKS)

1. Define wheel track and wheel base.

The distance between the tyre centers, mounted on the same axle is known as wheel track.

The wheelbase is the distance between the centers of the front and rear wheels

2. Give a brief note on damper.

It is used to dampen the vibrations of the suspension springs. It is mostly used in independent suspension.

3. Distinguish between disc brake with drum brake.

Sl.No	Drum Brakes	Disc Brakes
1	Relatively cheaper	Costlier
2	More weight	Lighter than drum brakes
3	Easily subjected to brake fading	Offer resistance to brake fading
4	Non uniform pressure distribution	Uniform pressure distribution

4. What is meant by bleeding of brakes?

The process of removing air from the hydraulic brakes is known as bleeding of brakes.

5. Define steering gear.

The steering gear is used to convert the rotational movement of the steering wheel into linear movement of the steering linkage. Moreover it provides mechanical advantage.

6. What is the purpose of Toe-in and Toe-out?

The purpose of providing a toe in and toe out is straight line stability of the vehicle, after negotiating a turn.

7. What are the different types of springs used in suspension system?

- Leaf springs (Rigid axle suspension)
- Coil springs (Independent suspension)
- Torsion bar (Independent suspension)

8. Define king pin inclination.

The tilt of the king pin from the vertical reference line is known as King Pin Inclination (KPI). It is also called as Steering Axis Inclination (SAI)

9. Define castor and camber.

Castor: Tilting the kingpin axis either forward or backward from the vertical line is known as castor.

Camber: When the front of the wheel is viewed, the angle between centre line of the tyre and vertical line is called camber.

10. What are the benefits of anti-lock brake system?

- Preventing the wheel from locking at the time of braking
- Keeping the wheel rotating
- Due to rotating wheel, it helps you to steer away the vehicle from the object, while applying brakes at the same time.
- It is even more effective in sand, snow, water, and mud where loss of traction is even higher, as on these surfaces, with normal braking system, it is even easier to lock wheels and loose traction but ABS works excellent in these conditions also and stops the vehicle in a much shorter distance.

11. What is steering ratio?

The steering ratio is defined as the ratio of angle turned on the steering wheel to the angle turned by the stub axle.

$$\text{Steering ratio} = \frac{\text{Angle turned on steering wheel}}{\text{Angle turned by the stub axle}}$$

12. What is toe in and toe out?

❖ Toe-in

The distance between the front ends of wheels is less than the rear end, the condition is said to be toe-in.

❖ Toe-out

The distance between the front ends of wheels is more than the rear end, the condition is said to be toe-out.

13. What are the types of steering gear box?

- Worm & Worm wheel steering gear
- Worm and Nut steering gear
- Worm and Roller steering gear
- Recirculating Ball steering gear
- Rack and Pinion steering gear

14. What are main advantages of power steering?

- The manual effort required to turn the vehicle is getting reduced.
- This layout also gives road feel to the driver.

15. What is function of suspension system in automobile?

The function of the suspension system is to isolate the vehicle and its occupants from road shocks and vibrations generated by the road surface, while maintaining steering control and stability at all times.

16. What is the function of brake? State its type.

The function of brake is to stop the vehicle within a short distance.

Types of brakes:

❖ Mechanical brakes

- Drum brakes
- Disc brakes

❖ Hydraulic brakes

❖ Power brakes

- Air brakes
- Air-hydraulic brakes
- Vacuum brakes
- Electric brakes

17. What are the functions of front axles?

- It carries the weight of the front of the vehicle
- It carries the horizontal and vertical loads on bumpy roads
- It works as a cushion through its spring for a comfortable ride
- In a four wheel drive, it also transmits power to the road wheels
- When brakes are provided at the front wheels, it withstands bending stresses and torsional stresses.

18. What I section at middle and oval section at end is preferred for front axle?

I section is suitable for bending loads and circular or oval section is suitable for torsional loads. Hence I section at middle and circular or oval section at ends is provided in the front axle.

19. What are the different types of stub axles? Which is the most preferred one?

- Elliot
 - Reversed Elliot
 - Lamoine
 - Reversed Lamoine
- ❖ *Out of the above four types, Reversed Elliot is the most preferred type.*

20. What is a self-energizing brake?

A brake is called self-energizing if it uses the rotational force of the wheel to help stop the automobile.

21. What is disc brake?

These brakes are different from drum brakes in that the drum is replaced by a circular plate and the brake shoes are replaced by a caliper which supports a pair of friction pads, one on each side of the disc. These pads are forced inward by the operating force and so retard the disc.

22. What is meant by electric brake?

In an electric brake, the current from the battery is utilized to energize an electromagnet within the brake drum. This actuates a cam to expand the brake shoes. When the current is not supplied, the cam and brake shoes are returned to the release position by retractor springs.

23. What is regenerative braking?

A regenerative brake is an energy recovery mechanism, which slows a vehicle by converting its kinetic energy into another form, which can be either used immediately or stored until needed. This contrasts with conventional braking systems, where the excess kinetic energy is converted to heat by friction in the brake linings and therefore wasted.

PART B (13 MARKS)

1. Sketch and explain a typical power steering gear box and compare it with ordinary steering system. *(AUC May'9, 11)*
2. Illustrate the types of front axle. *(AUC May'8, Dec'8)*
3. i) Sketch and explain various steering geometries.
ii) Describe with the help of simple diagram the different type of stub axles.
4. Explain the operation of Hydraulic braking system with neat sketch. *(AUC Nov'5, Apr'6, May'8)*
5. With the aid of neat sketches, Explain in detail about construction and working of disk brake system.
6. Explain in detail about a typical front suspension with neat sketches.
7. With an aid of neat sketch, explain the working principle of pneumatic suspension system. *(AUC May'*
8. Explain with the help of a suitable sketch the construction of the disc wheel.
9. Sketch and explain a typical power steering gear box and compare it with ordinary steering system.

PART C (15 MARKS)

1. Discuss the construction details of leaf, coil and torsion bar springs.
2. Explain independent suspension system. *(AUC May'14)*
3. Discuss the working of telescopic suspension system used in cars.
4. What is the working principle of Anti-lock braking system? Explain with neat sketch. *(AUC Dec'8, 12)*

UNIT-V
PART A (2 MARKS)

1. List the advantages of hydrogen fuel used in automobiles.

- It can be manufactured from water through electrolysis process
- It does not contain carbon. Hence, CO and unburned HC emissions are not present
- The flame speed is highest. Hence it results in high thermal efficiency
- It has wide ignition limits.

2. What is a hybrid vehicle?

A hybrid vehicle is a vehicle that uses two or more distinct power sources to move the vehicle. The term most commonly refers to hybrid electric vehicles (HEVs), which combine an internal combustion engine and one or more electric motors.

3. What is a fuel cell?

A fuel cell is an electrochemical device that converts a source fuel into an electrical current and water. It generates electricity inside a cell through reactions between a fuel and an oxidant, triggered in the presence of an electrolyte.

4. Write the composition of LPG and CNG.

❖ Composition of CNG

$\text{CH}_4 = 70.9\%$, $\text{C}_2\text{H}_6 = 5.10\%$, $\text{H}_2 = 3\%$, $\text{CO} + \text{CO}_2 = 22\%$

❖ Composition of LPG:

Propane = 30 % and Butane = 70 %

5. Define detonation and pre-ignition.

The abnormal combustion occurring in IC engines is called as detonation. This results in sudden rate of pressure rise, abnormal heat release, heavy vibrations of the engine and loud noise operation.

The ignition of the air-fuel mixture before the introduction of the spark in the combustion chamber is called as pre-ignition.

6. What are the advantages of an electric car?

- No emissions from an electric car
- It does not depend upon the availability fossil fuels

7. State the advantages of fuel cell.

- Higher efficiency than diesel or gas engines.
- Quiet operation.
- Fuel cells can eliminate pollution problems
- Don't need conventional fuels such as oil or gas and can therefore reduce economic dependence on oil producing countries, creating greater energy security for the user nation.
- The maintenance of fuel cells is simple since there are few moving parts in the system.

8. What are the types of fuel cell?

- Proton exchange membrane fuel cell
- Alkaline fuel cell
- Phosphoric acid fuel cell
- Direct methanol fuel cell
- Solid oxide fuel cell
- Molten carbonate fuel cell

9. What are the alternative fuels?

Alcohols, Hydrogen, Natural Gas, CNG, LNG, LPG, Bio Gas, Producer Gas, Coke oven Gas, Water Gas, Gasohol, Biodiesel

10. What are the various properties of gaseous fuel?

Advantages

- They can be pre-heated by the heat of hot waste gases, thereby affecting economy in heat.
- Their combustion can readily be controlled for change in demand like oxidizing or reducing atmosphere, length flame, temperature, etc.
- They do not require any special burner.
- They burn without any shoot, or smoke and ashes.
- They are free from impurities found in solid and liquid fuels.
- They are clean in use
- They have high heat contents and hence help us in having higher temperatures.

Disadvantages

- Very large storage tanks are needed.
- They are highly inflammable, so chances of fire hazards in their use are high.

11. What is CNG?

Compressed Natural Gas. It is typically stored in a tank at a pressure of 3,000 to 3,600 pounds per square inch.

12. What is BIO- DIESEL? State its advantages.

Biodiesel is a non-petroleum based diesel fuel which consists of the mono alkyl esters of long chain fatty acids derived from vegetable oil and animal fats.

13. What are advantages of LPG over conventional fuels?

- LPG contains less carbon than petrol
- LPG mixes with air at all temperatures
- In multi cylinder engines, a uniform mixture can be supplied to all cylinders
- Since the vapour in the form of vapour, no crankcase dilution
- Automobile engines can use propane if they use high compression ratio.
- LPG has better antiknock characteristics
- Running on LPG produces fuel saving cost of about 50%
- The engine will have 50% longer life.

14. What are the disadvantages of using alcohol as an alternative fuel?

- A larger quantity of fuel is required to produce a specified power output. For example, in an automobile, more fuel is required for each mile driven.
- Low boiling points and high vapor pressures of methyl and ethyl alcohol indicate that vapor lock could be a serious problem, particularly at high altitudes on warm summer days.
- The relatively high latent heats of methyl and ethyl alcohol cause problems in mixing these alcohols with air and transporting them through the intake manifold of the engine. Heating the intake manifold may be necessary in cold weather or before the engine reaches operating temperatures.

15. Define flame speed.

The speed at which flame travels inside the combustion chamber is called as flame speed. The unit is m/s

16. List out the various forms of natural gas.

- Natural Gas (NG)
- Compressed Natural Gas (CNG)
- Liquefied Natural Gas (LNG)

17. Write down the components of LPG equipment.

- Converter
- Mixer
- Gas Injector

18. Write down the parts of a fuel cell.

- Anode
- Cathode
- Electrolyte
- Fuel

19. What are the properties of CNG?

- Colourless
- Odourless
- Lighter than air
- Non - toxic

20. What are the two types of LPG used for automotive-engine fuel?

- Propane based LPG
- Butane based LPG

21. What are the main components of electric and hybrid vehicles?

- Gasoline engine
- Fuel tank
- Generator
- Electric motor
- Battery
- Transmission elements

22. What are the advantages of fuel cell?

- The only by product from the fuel cell is either water or CO₂, which can be safely disposed.
- It is compact in size
- As long as there is a supply of fuel, there will be generation of electricity.

23. What are the advantages of Gasohol?

- Gasohol – It is the mixture of 10 % Ethanol + 90 % unleaded gasoline o 10 % fuel savings in terms of consumption of petrol
- Less emissions than conventional petrol fuelled vehicles

PART B (13 MARKS)

1. What is LPG? What are the advantages & disadvantages of using it in automobiles? (AUC Dec'14)
2. Explain the construction and working principle of Fuel cells, with simple sketches.
3. Discuss in detail about different alternate fuels for automotive engines with respect to the following aspects:
(i) Emission, (ii) Cost, (iii) Reliability, (iv) Availability, (v) Engine modifications needed. (AUC Dec'12)
4. What is fuel cell? Enumerate the advantages & disadvantages of Fuel Cells? (AUC Nov'05, 07, May'11,15)
5. Explain the method of biodiesel production through transesterification process.
6. Discuss the alternative fuel suitable for compression ignition engine driven automobiles.
7. i) Briefly explain the methods of using natural gas as diesel engine fuel. (AUC Nov'07)
ii) List out the different properties of hydrogen relevant to its use of I.C. Engines.
8. i) Explain the series and parallel hybrid drive trains.
ii) Discuss the drive system of an electric vehicle.

PART C (15 MARKS)

1. Explain the bio diesel production method and its usage in automobile. (AUC May'08)
2. Explain the different types of hybrid vehicles with neat sketch. (AUC Nov'07, May'09, 12,15,Dec'12,14)